

Edexcel A Biology A-Level Core Practical 7

Investigate plant mineral deficiencies.





Plants require a range of nutrients to **grow**, **survive** and **reproduce**. These minerals include:

- **Nitrate**, which is used to form DNA and amino acids.
- **Calcium**, which is used to form calcium pectate for the middle lamella and in membrane permeability.
- **Magnesium**, which is used in the production of chlorophyll.

The effects of deficiencies of any of these minerals can be investigated specifically via **Bryophyllum** plants. *Bryophyllum* reproduce **asexually** via **budding**, which produces genetically identical 'daughter' plantlets.

Equipment

- *Bryophyllum* plantlets
- Nutrient solutions:
 - All minerals present
 - Without nitrogen
 - Without magnesium
 - Without calcium
 - Without any nutrients
- Measuring cylinder
- Test tube
- Test tube rack
- Tinfoil

Method

1. Use the measuring cylinder to fill test tubes with **each of the nutrient solutions**.
2. Cover the top of the test tube with **tinfoil**. Poke a hole through the tinfoil.
3. Push the **roots of the *Bryophyllum* plantlets** through the hole in the tinfoil into the solution.
4. Wrap the test tubes in tinfoil (to prevent light getting in) and place them under a **sunny window**.



Risk Assessment

Hazard	Risk	Safety Precaution	In emergency	Risk Level
Biohazard	Contamination	Use disinfectant; wash hands with soap after handling.	Seek assistance	Low
Broken glass	Cuts from sharp object	Take care when handling glassware; keep away from edge of desk	Elevate cuts; apply pressure; do not remove glass from wound; seek medical assistance	Low
Potassium nitrate	Flammable, reducing agent	Keep away from naked flame, avoid contact with metals and other flammable substances	Put out fire; seek assistance	Low
Iron chloride	Irritant when solid	Wear eye protection; keep away from naked flames.	Wash eyes and skin with cold water	Low
Potassium sulphate	Low hazard	Wear eye protection.	Wash eyes and skin with cold water	Low

Conclusion

- **Magnesium** deficiency: **stunted growth, yellowed leaves** (because chlorophyll cannot be synthesised).
- **Nitrate** deficiency: **yellowed leaves** with **red-brown** cast (because chlorophyll cannot be synthesised as protein synthesis is restricted).
- **Calcium** deficiency: **stunted growth, weakened stem** (because the support from the cell wall is reduced and metabolism is restricted due to decreased membrane **permeability**).

